

### 3.13 Transfer Functions



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The ratio of the output and input amplitudes for [Figure 3.29](#), known as the **transfer function** or the **frequency response**, is given by

$$\frac{V_{out}}{V_{in}} = H(f) = \frac{1}{j2\pi f RC + 1}$$

Implicit in using the transfer function is that the input is a complex exponential, and the output is also a complex exponential having the same frequency. The transfer function reveals how the circuit modifies the input amplitude in creating the output amplitude. Thus, the transfer function *completely* describes how the circuit processes the input complex exponential to produce the output complex exponential. The circuit's function is thus summarized by the transfer function. In fact, circuits are often designed to meet transfer function specifications. Because transfer functions are complex-valued, frequency-dependent quantities, we can better appreciate a circuit's function by examining the magnitude and phase of its transfer function ([Figure 3.30](#) (Magnitude and phase of the transfer function)).

#### Simple Circuit

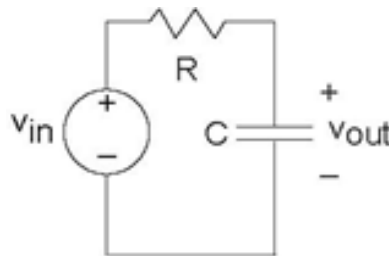


Figure 3.29 A simple RC circuit